

*DATA SUPPLEMENT FOR***MONAZITE TH-PB AGE DEPTH PROFILING**

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**Table 1:** Primary current variation, sputtering times, pit depths. Depths for 554 standard monazite represent measured values that have been normalized to 4 nA primary beam current. Owing to difficulties related to small grain size and poor optical imaging, we were unable to reliably measure pit depths produced DH-68-96 monazite. The values shown are calculated from the 554 monazite results after adjustment for variation in primary beam current. Starting depths (i.e., depths corresponding to the initial analysis) for all profiles have been estimated from the length of time required for pre-analysis tuning and mass calibration.

**Table 2:** Individual age profiles measured for unpolished DH-68-96 monazite. Depths calculated from data in Table 1. Age uncertainties are  $1\sigma$  standard error. Corrections for common  $^{208}\text{Pb}$  used to calculate  $^{232}\text{Th}$ - $^{208}\text{Pb}$  ages were based upon the  $^{207}\text{Pb}$  correction procedure (see Compston et al., 1984) using the composition of common Pb ( $^{208}\text{Pb}/^{207}\text{Pb} = 2.50 \pm 0.01$ ) measured in Tertiary Himalayan leucogranites (Vidal et al., 1982; Schärer et al., 1986).

**Table 3:** Individual age profiles measured for DH-68-96 monazite polished to a depth of ca. 15  $\mu\text{m}$ . Uncertainties are  $1\sigma$  standard error. Data reduced in the same manner as Table 2. Depths of analysis pits estimated from sputtering rate of 1.44  $\mu\text{m}/\text{hr}$  (see Table 1) and duration of analysis.

Table 1

Material Analyzed	Surface Condition	Position on Mount	Initial Current (nA)	Final Current (nA)	Mean Current (nA)	Pre-analysis Sputter (min)	Analysis Sputter (min)	Total Sputter (min)	Measured Depth <sup>1</sup> (μm)	Calculated Depth <sup>2</sup> (μm)	Starting Depth <sup>3</sup> (μm)
554	Unpolished	3 5 2	3.95	3.93	3.94	2.42	57.5	59.9	1.466	-	0.057
554	Unpolished	3 7 2	3.92	3.90	3.91	2.17	56.6	58.8	1.303	-	0.051
554	Unpolished	3 5 3	3.89	3.89	3.89	2.17	13.6	15.7	0.438	-	0.051
554	Unpolished	3 4 2	3.88	3.84	3.86	2.42	55.7	58.1	1.324	-	0.057
554	Unpolished	3 3 9	3.95	3.92	3.94	1.78	77.2	79.0	1.963	-	0.042
554	Unpolished	3 3 10	3.94	3.93	3.93	2.02	57.5	59.5	1.482	-	0.047
554	Unpolished	3 3 11	3.93	3.99	3.96	2.22	57.6	59.8	1.462	-	0.052
DH-68-96	Unpolished	2 6 1	3.89	3.94	3.92	2.05	57.6	59.7	-	1.372	0.047
DH-68-96	Unpolished	2 5 1	3.94	3.96	3.95	2.22	57.6	59.8	-	1.386	0.051
DH-68-96	Unpolished	2 2 1	3.96	3.98	3.97	2.08	57.6	59.6	-	1.390	0.049
DH-68-96	Unpolished	1 1 6	4.00	3.87	3.93	1.85	57.6	59.4	-	1.372	0.043
DH-68-96	Unpolished	1 1 7	3.88	3.86	3.87	1.92	57.6	59.5	-	1.353	0.044
DH-68-96	Unpolished	2 5 2	3.94	3.96	3.95	2.15	59.0	61.1	-	1.417	0.050
DH-68-96	Unpolished	1 2 3	3.97	3.99	3.98	1.93	57.6	59.5	-	1.390	0.045
DH-68-96	Unpolished	1 2 4	3.99	4.01	4.00	1.85	42.3	44.1	-	1.036	0.043

1. Normalized for primary current of 4 nA

2. Calculated from 1.44 μm/hr. and total sputter time after adjustment for variation in primary beam current

3. Calculated from 1.44 μm/hr. and pre-analysis sputter time after adjustment for variation in primary beam current

TABLE 2  
Unpolished DH-68-96 Monazite

r2gr5sp2			r1gr2sp3			r1gr2sp4			r2gr6sp1		
Pit Depth ( $\mu\text{m}$ )	Th-Pb Age (Ma)	Std. Error (Ma)									
0.050	-2.86	2.00	0.045	-6.31	2.06	0.043	-45.72	4.58	0.047	7.21	0.71
0.072	5.10	1.39	0.068	4.38	1.50	0.065	-13.67	2.99	0.070	9.06	0.56
0.095	6.77	1.10	0.091	5.01	1.21	0.087	-3.40	2.29	0.092	11.30	0.49
0.117	7.06	0.93	0.114	7.64	1.00	0.108	8.25	1.77	0.114	10.56	0.49
0.139	8.38	0.84	0.136	6.90	0.88	0.130	7.01	1.50	0.137	10.56	0.48
0.162	9.59	0.76	0.159	8.34	0.75	0.151	10.08	1.27	0.159	10.30	0.47
0.184	10.33	0.72	0.182	10.00	0.64	0.173	11.05	1.10	0.182	12.08	0.43
0.207	9.98	0.65	0.205	9.44	0.60	0.194	11.34	1.02	0.204	11.20	0.45
0.229	11.26	0.64	0.228	10.08	0.55	0.216	12.88	0.91	0.227	10.61	0.43
0.252	10.65	0.61	0.250	10.93	0.53	0.238	10.52	0.88	0.249	11.67	0.41
0.274	11.93	0.59	0.273	10.39	0.49	0.259	11.96	0.81	0.272	10.92	0.40
0.296	11.07	0.55	0.296	11.51	0.46	0.281	12.65	0.74	0.294	11.79	0.40
0.319	11.34	0.54	0.319	11.21	0.44	0.302	13.64	0.69	0.317	11.52	0.40
0.341	11.09	0.53	0.342	11.20	0.42	0.324	12.99	0.64	0.339	11.91	0.38
0.364	10.51	0.49	0.364	10.96	0.42	0.346	12.57	0.62	0.361	10.92	0.38
0.386	11.31	0.50	0.387	11.45	0.40	0.367	13.43	0.59	0.384	12.31	0.37
0.408	11.80	0.49	0.410	11.17	0.40	0.389	13.14	0.56	0.406	11.75	0.36
0.431	11.11	0.46	0.433	11.29	0.39	0.410	12.05	0.57	0.429	11.55	0.37
0.453	11.91	0.47	0.456	11.48	0.39	0.432	13.58	0.56	0.451	12.01	0.37
0.476	12.24	0.48	0.478	11.59	0.38	0.453	11.90	0.55	0.474	11.91	0.36
0.498	11.32	0.45	0.501	11.22	0.37	0.475	13.49	0.52	0.496	11.37	0.36
0.520	11.88	0.45	0.524	11.49	0.37	0.497	12.94	0.51	0.519	11.91	0.34
0.543	11.69	0.44	0.547	11.14	0.36	0.518	13.61	0.49	0.541	11.24	0.34
0.565	11.54	0.42	0.569	11.75	0.36	0.540	13.25	0.47	0.564	10.83	0.35
0.588	11.67	0.43	0.592	10.82	0.35	0.561	13.32	0.45	0.586	12.40	0.34
0.610	11.65	0.40	0.615	11.61	0.36	0.583	13.50	0.47	0.608	12.39	0.33
0.633	12.18	0.43	0.638	11.10	0.33	0.605	13.20	0.45	0.631	11.84	0.33
0.655	11.76	0.41	0.661	11.29	0.35	0.626	12.83	0.44	0.653	11.52	0.32
0.677	12.09	0.42	0.683	11.54	0.34	0.648	13.78	0.44	0.676	11.42	0.32
0.700	12.17	0.42	0.706	11.51	0.34	0.669	12.63	0.43	0.698	11.55	0.32
0.722	12.34	0.42	0.729	11.76	0.33	0.691	12.64	0.42	0.721	11.96	0.32
0.745	12.04	0.41	0.752	11.74	0.34	0.712	12.33	0.42	0.743	12.37	0.32
0.767	13.00	0.42	0.775	10.90	0.33	0.734	13.05	0.41	0.766	11.77	0.32
0.789	11.57	0.40	0.797	11.62	0.33	0.756	14.06	0.42	0.788	11.69	0.31
0.812	12.72	0.40	0.820	11.66	0.33	0.777	13.65	0.40	0.810	12.16	0.32
0.834	11.89	0.38	0.843	11.45	0.34	0.799	13.09	0.40	0.833	11.80	0.31
0.857	12.06	0.40	0.866	11.53	0.33	0.820	12.17	0.41	0.855	12.35	0.32
0.879	12.26	0.39	0.889	11.57	0.33	0.842	13.22	0.41	0.878	11.82	0.32
0.901	12.03	0.39	0.911	11.84	0.33	0.864	13.02	0.41	0.900	11.64	0.31
0.924	12.54	0.40	0.934	11.84	0.32	0.885	13.10	0.40	0.923	11.06	0.32
0.946	11.57	0.38	0.957	11.37	0.32	0.907	13.80	0.42	0.945	11.85	0.31
0.969	12.81	0.41	0.980	11.70	0.34	0.928	13.34	0.40	0.968	11.66	0.31
0.991	12.63	0.39	1.003	11.62	0.33	0.950	13.20	0.40	0.990	11.55	0.30
1.014	11.98	0.38	1.025	11.61	0.34	0.971	13.06	0.41	1.013	12.18	0.30
1.036	12.80	0.39	1.048	11.62	0.32	0.993	12.92	0.40	1.035	11.74	0.31
1.058	12.24	0.39	1.071	11.81	0.32	1.015	13.49	0.40	1.057	11.55	0.30
1.081	12.17	0.38	1.094	12.05	0.33	1.036	13.80	0.40	1.080	12.11	0.30
1.103	12.94	0.40	1.117	11.92	0.32				1.102	11.51	0.31
1.126	12.71	0.38	1.139	12.64	0.32				1.125	12.00	0.29
1.148	12.66	0.37	1.162	12.33	0.33				1.147	11.05	0.30
1.170	12.44	0.38	1.185	11.68	0.33				1.170	12.03	0.30
1.193	12.43	0.38	1.208	11.76	0.31				1.192	11.63	0.30
1.215	12.21	0.37	1.231	12.50	0.32				1.215	11.42	0.30
1.238	12.23	0.36	1.253	12.08	0.32				1.237	12.22	0.29
1.260	11.90	0.36	1.276	12.60	0.33				1.260	12.24	0.30
1.283	13.02	0.38	1.299	12.24	0.31				1.282	11.73	0.30
1.305	13.06	0.39	1.322	12.35	0.31				1.304	11.86	0.29
1.327	13.11	0.38	1.345	12.62	0.32				1.327	11.93	0.30
1.350	12.34	0.36	1.367	12.05	0.32				1.349	12.40	0.29
1.372	12.38	0.36	1.390	12.32	0.32				1.372	11.63	0.29
1.395	12.32	0.37									
1.417	12.69	0.36									

TABLE 2  
Unpolished DH-68-96 Monazite

r2gr5sp1			r2gr1sp1			r1gr1sp6			r1gr1sp7		
Pit	Th-Pb	Std.	Pit	Th-Pb	Std.	Pit	Th-Pb	Std.	Pit	Th-Pb	Std.
Depth	Age	Error	Depth	Age	Error	Depth	Age	Error	Depth	Age	Error
( $\mu\text{m}$ )	(Ma)	(Ma)	( $\mu\text{m}$ )	(Ma)	(Ma)	( $\mu\text{m}$ )	(Ma)	(Ma)	( $\mu\text{m}$ )	(Ma)	(Ma)
0.051	1.02	1.18	0.049	5.89	1.37	0.043	-48.81	4.30	0.044	-6.73	1.50
0.074	6.33	0.88	0.071	9.15	1.12	0.065	-13.98	2.60	0.066	-2.46	1.08
0.097	6.98	0.74	0.094	10.94	1.02	0.088	-8.60	1.93	0.088	1.83	0.83
0.119	7.18	0.63	0.117	12.58	0.92	0.110	-1.00	1.48	0.110	2.23	0.68
0.142	7.09	0.56	0.140	11.68	0.89	0.133	1.18	1.19	0.132	5.55	0.54
0.164	9.58	0.49	0.162	11.96	0.86	0.155	4.39	0.96	0.155	5.77	0.47
0.187	8.66	0.46	0.185	12.68	0.84	0.178	6.56	0.81	0.177	5.83	0.43
0.210	9.50	0.44	0.208	10.00	0.80	0.200	5.13	0.74	0.199	6.61	0.38
0.232	9.98	0.40	0.230	13.36	0.76	0.223	8.60	0.63	0.221	7.10	0.36
0.255	9.65	0.39	0.253	12.98	0.72	0.245	7.80	0.57	0.243	7.01	0.35
0.278	9.39	0.37	0.276	12.02	0.72	0.268	8.23	0.52	0.266	7.48	0.34
0.300	9.70	0.36	0.299	11.92	0.70	0.291	8.27	0.49	0.288	7.35	0.32
0.323	10.29	0.35	0.321	13.39	0.68	0.313	9.38	0.46	0.310	7.70	0.31
0.345	9.23	0.35	0.344	12.00	0.65	0.336	8.79	0.42	0.332	7.54	0.31
0.368	9.78	0.35	0.367	12.61	0.64	0.358	9.62	0.42	0.354	7.33	0.31
0.391	10.03	0.33	0.390	11.91	0.63	0.381	9.53	0.43	0.376	8.08	0.29
0.413	10.07	0.33	0.412	13.28	0.61	0.403	9.45	0.41	0.399	7.96	0.28
0.436	10.25	0.33	0.435	13.68	0.63	0.426	10.39	0.38	0.421	7.79	0.29
0.458	9.95	0.32	0.458	12.64	0.61	0.448	9.87	0.40	0.443	7.74	0.29
0.481	10.05	0.32	0.481	13.03	0.61	0.471	10.62	0.37	0.465	8.50	0.28
0.504	10.96	0.32	0.503	13.53	0.60	0.493	10.65	0.36	0.487	8.65	0.26
0.526	10.32	0.30	0.526	12.52	0.59	0.516	10.88	0.36	0.510	7.87	0.27
0.549	10.85	0.31	0.549	13.43	0.60	0.538	10.87	0.36	0.532	8.45	0.27
0.572	10.13	0.31	0.572	13.38	0.59	0.561	10.56	0.35	0.554	8.57	0.27
0.594	10.69	0.31	0.594	12.71	0.59	0.583	10.66	0.35	0.576	7.57	0.26
0.617	11.15	0.31	0.617	12.27	0.61	0.606	11.21	0.33	0.598	8.29	0.26
0.639	10.42	0.30	0.640	14.14	0.61	0.628	11.15	0.34	0.621	8.27	0.27
0.662	10.67	0.31	0.663	13.65	0.61	0.651	11.06	0.34	0.643	8.69	0.26
0.685	10.28	0.29	0.685	14.10	0.60	0.674	10.74	0.34	0.665	8.42	0.27
0.707	10.81	0.29	0.708	12.81	0.60	0.696	11.03	0.34	0.687	8.58	0.25
0.730	9.71	0.29	0.731	12.63	0.60	0.719	11.32	0.34	0.709	8.61	0.26
0.752	10.43	0.29	0.753	13.57	0.58	0.741	11.37	0.33	0.732	9.03	0.25
0.775	11.01	0.29	0.776	13.26	0.58	0.764	11.30	0.34	0.754	8.85	0.26
0.798	10.34	0.29	0.799	12.43	0.56	0.786	11.63	0.35	0.776	8.75	0.25
0.820	10.29	0.29	0.822	12.60	0.54	0.809	11.48	0.33	0.798	8.90	0.26
0.843	10.57	0.28	0.844	13.29	0.53	0.831	11.65	0.32	0.820	8.99	0.26
0.866	10.62	0.29	0.867	12.40	0.51	0.854	11.64	0.32	0.842	9.22	0.26
0.888	10.64	0.28	0.890	13.29	0.50	0.876	11.89	0.33	0.865	9.29	0.25
0.911	10.71	0.29	0.913	12.58	0.49	0.899	11.76	0.32	0.887	9.38	0.26
0.933	10.89	0.28	0.935	13.19	0.49	0.921	11.97	0.33	0.909	9.31	0.26
0.956	11.26	0.29	0.958	14.15	0.49	0.944	11.84	0.33	0.931	8.89	0.25
0.979	11.04	0.28	0.981	14.18	0.50	0.966	11.41	0.32	0.953	9.28	0.27
1.001	10.51	0.28	1.004	13.46	0.48	0.989	11.71	0.32	0.976	9.07	0.25
1.024	11.27	0.28	1.026	12.93	0.47	1.011	11.65	0.33	0.998	9.40	0.26
1.046	11.13	0.29	1.049	13.16	0.46	1.034	11.45	0.32	1.020	9.04	0.26
1.069	11.17	0.28	1.072	13.35	0.46	1.056	11.91	0.32	1.042	9.39	0.27
1.092	11.10	0.28	1.095	12.32	0.47	1.079	11.61	0.32	1.064	9.82	0.27
1.114	10.78	0.27	1.117	13.19	0.45	1.102	11.54	0.32	1.087	9.52	0.26
1.137	11.03	0.27	1.140	12.48	0.46	1.124	11.90	0.33	1.109	9.98	0.27
1.160	11.16	0.27	1.163	14.24	0.46	1.147	11.47	0.33	1.131	9.57	0.27
1.182	11.07	0.27	1.185	13.13	0.44	1.169	11.88	0.34	1.153	9.46	0.27
1.205	10.85	0.28	1.208	13.33	0.44	1.192	11.92	0.32	1.175	9.43	0.26
1.227	10.79	0.28	1.231	12.62	0.44	1.214	12.43	0.33	1.198	10.12	0.27
1.250	11.06	0.27	1.254	12.98	0.45	1.237	12.15	0.33	1.220	9.75	0.26
1.273	11.20	0.27	1.276	13.01	0.44	1.259	12.33	0.32	1.242	9.81	0.27
1.295	11.35	0.27	1.299	13.19	0.44	1.282	12.04	0.32	1.264	9.56	0.27
1.318	10.97	0.27	1.322	12.74	0.44	1.304	11.72	0.31	1.286	10.34	0.26
1.340	10.91	0.27	1.345	13.52	0.42	1.327	11.92	0.32	1.309	10.25	0.27
1.363	10.90	0.27	1.367	12.96	0.41	1.349	12.19	0.32	1.331	10.13	0.28
1.386	10.73	0.27	1.390	13.12	0.40	1.372	11.98	0.32	1.353	9.61	0.27

**Table 3**  
**Polished DH-68-96 Monazite**

<b>r1g1sA</b>			<b>r1g1sB</b>			<b>r1g1sC</b>			<b>r1g1sD</b>		
Pit Depth ( $\mu\text{m}$ )	Th-Pb Age (Ma)	Std. Error (Ma)									
0.050	13.70	1.22	0.045	13.72	0.98	0.051	12.21	0.57	0.044	13.27	0.85
0.074	13.83	1.19	0.069	13.59	0.91	0.075	12.52	0.58	0.068	12.92	0.82
0.098	13.66	1.18	0.093	13.68	0.94	0.099	12.65	0.59	0.092	13.26	0.84
0.122	13.59	1.17	0.117	13.73	0.96	0.123	12.42	0.56	0.116	13.11	0.81
0.146	13.69	1.17	0.141	13.68	0.95	0.147	12.63	0.57	0.140	13.06	0.83
0.170	13.77	1.17	0.165	13.38	0.92	0.171	12.55	0.57	0.164	13.30	0.83
0.194	13.82	1.19	0.189	13.21	0.91	0.195	12.71	0.56	0.188	13.49	0.86
0.218	13.65	1.15	0.213	13.55	0.93	0.219	12.60	0.57	0.212	13.37	0.85
0.242	13.54	1.16	0.237	13.73	0.94	0.243	12.53	0.57	0.236	13.45	0.83
0.266	14.60	1.42	0.261	13.46	0.90	0.267	12.58	0.56	0.260	13.51	0.82
0.290	13.63	1.16	0.285	13.15	0.88	0.291	12.51	0.54	0.284	13.41	0.83
0.314	13.53	1.14	0.309	13.51	0.89	0.315	12.28	0.52	0.308	13.53	0.81
0.338	13.74	1.16	0.333	13.54	0.92	0.339	12.31	0.51	0.332	13.65	0.81
0.362	13.97	1.20	0.357	13.67	0.91	0.363	12.25	0.50	0.356	13.56	0.82
0.386	13.82	1.18	0.381	13.79	0.94	0.387	12.45	0.50	0.380	13.62	0.83

  

<b>r1g2sA</b>			<b>r1g2sB</b>			<b>r1g4sA</b>			<b>r2g1sA</b>		
Pit Depth ( $\mu\text{m}$ )	Th-Pb Age (Ma)	Std. Error (Ma)									
0.042	13.35	0.66	0.051	12.28	0.28	0.053	12.42	0.44	0.046	12.28	0.61
0.066	13.16	0.62	0.075	12.30	0.27	0.077	12.55	0.43	0.070	12.26	0.58
0.090	13.22	0.60	0.099	12.48	0.27	0.101	12.72	0.43	0.094	12.72	0.60
0.114	13.50	0.63	0.123	12.71	0.29	0.125	12.70	0.43	0.118	12.27	0.56
0.138	13.51	0.64	0.147	12.20	0.27	0.149	12.99	0.42	0.142	12.50	0.56
0.162	13.47	0.62	0.171	12.14	0.27	0.173	12.72	0.42	0.166	12.40	0.56
0.186	13.45	0.61	0.195	12.45	0.26	0.197	12.57	0.41	0.190	12.19	0.54
0.210	13.44	0.57	0.219	12.13	0.25	0.221	12.63	0.41	0.214	12.72	0.57
0.234	13.46	0.61	0.243	12.26	0.26	0.245	12.63	0.41	0.238	12.21	0.51
0.258	13.60	0.62	0.267	12.28	0.26	0.269	12.73	0.41	0.262	12.49	0.54
0.282	13.55	0.60	0.291	12.22	0.27	0.293	12.70	0.43	0.286	12.36	0.55
0.306	13.47	0.57	0.315	12.28	0.25	0.317	12.66	0.41	0.310	12.48	0.54
0.330	13.80	0.59	0.339	11.97	0.25	0.341	12.80	0.41	0.334	12.54	0.54
0.354	13.86	0.64	0.363	12.67	0.28	0.365	12.91	0.41	0.358	12.47	0.53
0.378	13.57	0.58	0.387	12.38	0.26	0.389	12.77	0.40	0.382	12.31	0.52

  

<b>r2g2sA</b>			<b>r2g2sB</b>			<b>r2g5sA</b>			<b>r2g6sA</b>		
Pit Depth ( $\mu\text{m}$ )	Th-Pb Age (Ma)	Std. Error (Ma)									
0.048	11.96	0.59	0.053	12.37	0.79	0.042	13.86	1.38	0.048	12.34	0.85
0.072	11.92	0.56	0.077	12.51	0.73	0.066	13.93	1.38	0.072	12.60	0.85
0.096	11.89	0.55	0.101	12.52	0.70	0.090	14.33	1.44	0.096	12.50	0.81
0.120	11.84	0.54	0.125	13.07	0.72	0.114	14.14	1.34	0.120	12.76	0.82
0.144	12.13	0.56	0.149	12.64	0.68	0.138	13.91	1.32	0.144	12.62	0.81
0.168	12.03	0.54	0.173	12.58	0.67	0.162	13.64	1.28	0.168	12.63	0.78
0.192	12.05	0.56	0.197	12.78	0.69	0.186	14.01	1.33	0.192	13.02	0.85
0.216	12.06	0.54	0.221	12.80	0.67	0.210	13.81	1.30	0.216	12.51	0.79
0.240	12.03	0.55	0.245	12.78	0.67	0.234	13.74	1.21	0.240	12.57	0.78
0.264	12.03	0.55	0.269	12.57	0.65	0.258	13.67	1.20	0.264	12.79	0.80
0.288	12.17	0.55	0.293	12.50	0.62	0.282	13.79	1.24	0.288	12.74	0.80
0.312	12.05	0.54	0.317	12.33	0.60	0.306	13.79	1.23	0.312	12.76	0.79
0.336	12.03	0.55	0.341	12.92	0.66	0.330	13.60	1.16	0.336	12.60	0.75
0.360	12.24	0.54	0.365	13.07	0.64	0.354	13.75	1.20	0.360	12.65	0.75
0.384	11.95	0.53	0.389	12.93	0.63	0.378	13.64	1.16	0.384	12.66	0.76